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Does access to credit improve productivity? Evidence from Bulgarian firms*

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Abstract

Although it is widely accepted that financial development is associated with higher growth, the evidence on the channels through which credit affects growth on the micro-level is scant. Using data from a cross section of Bulgarian firms, we estimate the impact of access to credit (as proxied by indicators of whether firms have access to a credit or overdraft facility) on productivity. To overcome potential omitted variable bias of OLS estimates, we use information on firms' past growth to instrument for access to credit. We find credit to be positively and strongly associated with TFP. These results are robust to a wide range of robustness checks.

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1. Introduction

The link between finance and growth has become one of the stylized facts in the recent development literature.. Recent evidence from transition economies supports this widely accepted view (see Koivu (2002), Coricelli and Masten (2004) and Beck and Laeven, (2004)). However, the precise channels through which finance operates are still unclear. For example, Levine (2005) suggests that finance may influence long-run growth through its impact on savings rates, investment decisions and technological innovation. However, in the same article Levine states that "We are far from definite answers to these questions: Does finance cause growth, and if it does, how?". In this paper we provide evidence to answer the second question.

One possible channel through which finance affects growth is via improvement in productivity. Several models provide theoretical justification to the proposition that credit affects growth through its impact on productivity. In these models financial sector provides real services through alleviation of information and transaction costs, in particular making the longer-gestation higher return projects more attractive (see, for example, Levine (1991) and Bencivenga, Smith and Starr (1995)). However, the existing empirical evidence on this channel is still limited. At the macro level, Easterly and Levine (2001) show that total factor productivity (TFP) accounts for most of the variation in the cross-country differences in economic development and growth. They go as far as to claim that factor accumulation is not important for future growth and but productivity is.[1] Levine and Zervos (1998) argue that "the major channel through which growth is linked to stock markets and banks is through

[1] A recent paper by Bond et al. (2004) questions that view and shows that capital accumulation is important for growth.

productivity growth." However, rapid credit growth might also have a reverse, negative, impact on productivity. For example, Ghani and Suri (1999) argue that the rapid growth of bank credit was associated with negative productivity growth in Malaysia because allocation of credit was inefficient.

We use information from a cross section of Bulgarian firms to estimate whether access to credit is associated, and causally so, with higher productivity. To our knowledge, there are only a few firm-level studies that attempt to evaluate the effect of access to credit on total factor productivity. Bernstein and Nadiri (1993) estimate the effect of financial structure on productivity growth in US manufacturing companies. Their focus is on estimating the impact of agency cost of debt and the signaling benefits of dividends on productivity growth. Nickell and Nicholitsas (1999) find that financial pressure (defined as the ratio of interest payments to cash flow) has a positive effect on productivity. They deal with endogeneity of financial pressure by using instruments of lagged debt burden and yield on treasury bonds. Using data from the UK and Italy, Schiantarelli and Sembenelli (1999) show that firms with a larger proportion of long-term debt in their capital structure have improved subsequent performance measured as profitability, sales growth and total factor productivity. Similar patterns are found in Schiantarelli and Jaramillo (1999) for Ecuador and Schiantarelli and Srivastava (1999) for India. However, due to data limitations, all the previous studies focused on the effect of leverage on productivity.[2] In our paper we are able to use more direct measures of access to credit, such as presence or absence of overdrafts and lines of credit. Several recent papers estimated TFP in transitional economies. Hoekman and Djankov (1999) estimate the effects of trade liberalization

[2] A related strand of literature focused on the relationship between productivity and leverage in firms that have undergone a leveraged buyout. (See Lichtenberg and Siegel (1990), Ravencraft and Scherer (1987)).

and access to global markets on TFP growth in Bulgaria. They argue that firms that increase their imports of intermediate and capital goods have higher productivity growth.[3] Access to capital to finance these imports could be an important driving force for these productivity improvements, which is the focus of our paper. A related paper by Maurel (2001) estimated TFP for a panel of Hungarian firms but is focused mainly on the effect of investment on TFP and not on the relationship between access to credit and TFP, which we investigate here.

Our paper contributes to the existing literature in a number of ways. First, we are able to test directly for the importance of credit for productivity by using indicators of access to credit (whether a firm has access to a credit line or overdraft). As OLS estimates of access to credit on productivity potentially suffer from omitted variable bias, we use past information about firm growth to instrument for access to credit in order to obtain two stage estimates and identify a causal impact of credit on productivity. We find that, indeed, access to credit has a casual positive effect on productivity. We then subject our results to a number of robustness checks to verify that indeed our instruments are valid in this context.

Assessing the role of credit in determining productivity is also particularly relevant from a policy point of view in the context of Bulgaria. In the late 1900s irresponsible quasi-fiscal policies brought about a deep financial crisis in Bulgaria (1996-97) that resulted in hyperinflation reaching peaks of 1000% and in a dramatic drop in private investment. Following the crisis, the government adopted a strong commitment to fiscal responsibility by introducing a currency board and a broad range of market

[3] Interestingly, Hoekman and Djankov (1999) find that the percent of output exported has no significant effect on total factor productivity.

oriented reforms. Because of the collapse of the financial sector, virtually no credit was available to the private sector. However, starting in 2001, credit to the private sector grew at progressively faster rates. For example, bank claims on the non-government sector rose by nearly 8 percentage points of GDP in 2003 (IMF, Article IV consultations) without any sign of deterioration in banks' prudential indicators. Such rapid credit growth and the related widening of the current account deficit generated concerns of overheating in the economy and induced the authorities to implement restrictive measures in October 2004 to curb it.

The paper is organized as follows. Section 2 described the data. Section 3 discusses alternative TFP estimates and methodology. Section 4 presents the results of the two-stage estimation and the robustness checks. Section 5 concludes.

2. Data description

We use a recent survey of Bulgarian enterprises which was conducted by the IFC/World Bank in March-April 2004 (FIAS). The survey contains information on 548 Bulgarian firms sampled according to a number of criteria: (i) size, so as to be representative of SMEs and to include a minimum of 20% of large firms; (ii) sectors, so as to mirror the distributions of Bulgarian firms across manufacturing, mining, and services; and (iii) location, so as to include firms in large cities (200), small towns (100), and the capital, Sofia. The survey reports detailed information on administrative and bureaucratic constraints to business and a limited amount of

balance sheet-type data.[4] Table 1, Panel A reports distribution of firms in our sample by industry and size.

About 60% of the surveyed firms work in manufacturing and 30% is engaged in service activities. Access to selling markets is fairly dichotomous: 63% of the firms sell only domestically – these are mostly micro and small enterprises engaged in manufacturing and services.[5] Exporters sell on average more than 60% of their output to foreigners, indicating that there might be important costs to set up production for export. About 75% of the exporters sell to EU markets (to Germany, Italy, and Greece). Half of these sell also to Eastern Europe and Central Asia markets, in particular to Macedonia, Russia, and Turkey.

Foreign ownership is highly concentrated. In the sample for which TFP can be estimated, 10% of firms are foreign owned and, among these, 75% of firm capital is in foreign hands.

Firms report, amongst others, the value of total sales and fixed assets as well as information on employees, wages and costs as a percentage of total sales. We use this information to obtain estimates of TFP.

The survey has several different indicators of access to credit. Firms report whether they have a credit line or an overdraft facility. As our main indicator of access to credit, we use a variable (LINE) taking value of one if the firm has either overdraft or a credit line and zero otherwise. We combine overdrafts and credit lines together as

[4] See "Investment Climate and Regulatory Cost Survey," IFC, for more details on the survey.
[5] Firm size is defined as follows: micro enterprises (up to 10 employees); small (between 11 and 50 employees); medium (between 51 and 100 employees); large (more than 100 employees).

both instruments represent easy access to immediate liquidity and both have short-term maturity. About 18% of firms have an overdraft facility and about 20% have a line of credit, and about 30% of firms in our sample have either overdraft or credit line. Credit availability increases with firm size: only 10% of micro enterprises, between 20% and 30% of small and medium enterprises, and about 40% of large enterprises have a credit line or overdraft. Table 1, Panel B reports distribution of firms with and without access to credit, by size.

The survey also asks firms to rank a number of different obstacles to doing business (rankings range from no obstacle to major obstacle). Access to credit is listed as one of the major obstacles. Interestingly, there is no correlation between the extent to which firms rank access to credit to be an obstacle to business and firm size. While access to a credit line or availability of debt are objective measures of access to credit, the obstacle rankings are very subjective, and are likely to depend on personal characteristics of managers. In fact, there is no significant correlation between obstacles rankings and actual presence of credit lines and debt. Therefore, we prefer to use objective measures of access, such as our variable LINE.

Table 2 reports descriptive statistics for the main variables.

3. Estimating productivity

Firm productivity is an unobservable firm characteristics. However, estimates of productivity can be recovered as the difference between actual output and output

estimated by a production function using actual input quantities. Productivity estimates can be obtained from a regression of the type:

$$\ln Y_i = \alpha + \beta_k \ln K_i + \beta_l \ln L_i + \varepsilon_i \qquad (1)$$

where Y_i is firm's output, K and L are capital and labor, β_k and β_l are capital and labor shares and ε_i is the error. In this model, TFP, the estimated residual, is obtained as the difference between actual and predicted output, or $\hat{\varepsilon}_i = \ln Y_i - \ln \hat{Y}_i$.

The simplest model can be estimated by OLS. However, econometric issues arise because firm productivity can affect input choices. For example, firms that receive a productivity shock may alter their mix of inputs. This implies that the error and the regressors in (1) might be correlated and that coefficient estimates obtained with OLS might be biased. A number of solutions have been proposed in the literature to overcome this problem. These include using firm-level fixed effects, that would deal with time-invariant individual effects, and instrumental variable strategy for input choices. Following Olley and Pakes (1996), Levinsohn and Petrin (2000) argued that using information on intermediate input choices such as demand for electricity – which tracks productivity shocks quite closely and cannot be stored – one can effectively control for productivity shocks and thus obtain consistent and unbiased estimates of β_k and β_l (see discussion in Hallward-Driemeier et al., 2002).

We use several estimates of TFP to check for robustness and minimize possible biases. The simplest measure is obtained from a pooled OLS regression, in which all 3 main sectors (manufacturing, construction and services) are pooled together. This

means that all sectors have the same coefficients on capital and labor shares, however they are allowed to have different intercepts (by means of industry dummies). We refer to this measure as TFP_POOL. In addition, we run separate TFP regressions for all 3 sectors, thus allowing each sector to have their sector-specific capital and labor shares. The estimates obtained, TFP_S, allow production technology to differ across main sectors.

Table 3 reports production function estimates obtained using pooled OLS across sectors (TFP_POOL) and OLS by sector (TFP_S), which we find to be highly correlated (correlation of 0.99). In the pooled regression, the labor and capital shares are estimated to be around 0.3 and 0.8, which seems in line with conventional wisdom. The regression is estimated with precision, with a surprisingly high R^2 of about 0.8. Interestingly, the manufacturing and services estimates are not significantly different from each other, while construction appears to be more capital-intensive. We also report value added TFP (TFP_VA), which we employ further on to perform robustness checks on the estimation of the impact of the credit variable (column 5).[6]

In order to correct for the possible simultaneity bias of OLS estimation, we use two approaches. First, we use instrumental variables, which appears suitable to the structure of our dataset and the information it contains. Instruments that are correlated with the input choice but not directly with productivity are likely to perform well. Input prices are commonly used as instruments in TFP regressions (see for example, Levinsohn and Petrin (2000)). The amount spent on wages is a natural choice to instrument for (log) employment. Moreover, sampled firms report the average

[6] We do not use value-added estimates as our baseline because the number of observations is significantly reduced when using this measure.

amount of annual sales they spent since 2001 for new buildings, machinery and equipment, as well as for research and development (R&D). These variables were mainly determined in the past – and as such are unlikely to be correlated with current productivity shocks – but should predict well the current level of capital. We expect past investment to be positively related to current capital stock. Conversely, R&D expenditure is likely to be negatively related to capital, as firms that spend more on R&D, which is intangible capital, usually spend less on tangible assets such as machinery and equipment. The estimates of the first stage regressions reported in columns (6) and (7) are statistically significant and of the expected sign. The first stage regressions are estimated quite precisely – the labor equation has a R^2 of 0.85 and the capital equation has an R^2 of 0.6. The instrumental variable estimation of the production function is reported in column (8). The labor and capital shares are not significantly different from the OLS estimates, however the labor share is slightly higher and the capital share is slightly lower than those obtained with OLS. The test of over-identifying restrictions produces a p-value of 0.88, so we cannot reject the hypothesis that our instruments are not correlated with the error (i.e. with productivity shocks) in the main regression.

Our second approach to address simultaneity bias resulting from OLS estimation of TFP is to adjust our TFP estimate to reflect possible biases. Levinsohn and Petrin (2000) report the distribution of the difference between the OLS estimates and unbiased estimates of labor and capital shares. OLS estimates on capital share are usually biased downward (by about 0.05, on average) and labor shares are usually biased upward (by about 0.05, on average). We use these estimates of biases to

correct TFP obtained from OLS regression and employ this additional variable (TFP_ADJ) for further robustness checks.

Given the high correlation among the different estimates of TFP, we present our main results using one of the estimates (TFP_S) and use the others to perform robustness checks. We should also note that some recent research has highlighted that OLS and 2SLS TFP estimates do not differ substantially (see Eslava et al, 2004).

4. Access to credit and productivity

We first present OLS estimates of main correlates of firm TFP and assess the impact, if any, of access to credit as proxied by the presence of a credit line or overdraft facility. We then discuss the econometric problems associated with OLS estimation in this context, discuss the validity of a set of instruments, and present 2SLS estimation. Finally, we discuss a number of sensitivity checks to assess the robustness of our estimation.

4.1 OLS estimates

We regress estimated TFP on a number of basic correlates and then add to this baseline specification our main variable of inference. The results are reported in Table 4. We find that large enterprises are overall more productive, particularly if compared to micro enterprises. As expected, companies that were previously government owned are overall less productive. Also, younger firms are on average more productive.

However, neither effect is statistically significant, most likely because both variables are highly correlated and pick up similar effects (we obtain more significant results when only one of the two variables is included). Foreign ownership (as captured by a dummy taking a value of 1 when more than 10% of the company is foreign owned) does not seem to significantly affect productivity. Surprisingly, productivity is higher in firms that sell most of their goods domestically.[7]

More importantly, having access to a credit line or an overdraft facility is positively and significantly associated with higher productivity (model 3). The OLS estimate suggests that going from not having access to having access is associated with an increase in productivity by about 2/3 of a standard deviation.

It is important to note that credit line could proxy for a number of other firm characteristics. In particular, the ability of managers (and workforce in general) might be positively correlated with both access to credit and productivity. To control for this possible source of bais, we use a measure of overall workforce education to proxy for ability of managers. We find that while this proxy is significantly and positively related to TFP, our access indicator is not affected by its inclusion . The overall predicted power of our regression is improved with the inclusion of workforce education, as the R^2 increases from 0.16 to 0.25.

[7] Note that productivity appears to be higher in those firms that diversify their markets and sell both domestically and abroad. In fact when a variable Export10, taking value of 1 when firms that export more than 10% of their output is added to the current specification, both the Export10 dummy and SELLDOM are significant and positive. The OLS and 2SLS estimates of the CREDIT coefficient are robust to including or excluding the export dummy.

The positive association between access to credit and productivity can indicate either that credit fosters productivity or that credit goes to more productive firms. Because of this, OLS coefficients are likely to be biased. In the next section we will discuss instrumental variable estimation to overcome this problem.

4.2 Instruments and 2SLS

Although the information in the survey is mainly cross sectional, firms were asked to report whether their sales grew in 2001 and 2002. A priori we expect banks to be more likely to extend credit to successful firms, and therefore to find a positive correlation between LINE and indicators of positive growth in the past. Table 5 reports the first-stage regressions to predict LINE using dummies for recording a positive growth in addition to other exogenous variables. We find indeed that growth dummies are significant individually and jointly (F-stat of 5.27). At the same time, we do not expect past growth to affect current productivity by channels other than the access to credit. We subject this assumption to a test of over-identifying restrictions and other robustness checks discussed below.

Model (1) in Table 6 reports the instrumental variables regression. We find LINE to be significantly and positively associated with productivity. The test of over-identifying restrictions cannot reject that the instruments are valid (P-value of 0.77).

4.3 Robustness checks

In this section we discuss a number of robustness checks that try to address legitimate concerns with the IV strategy. First, we include other potentially important regressors to rule out the possibility that the coefficient on LINE might capture the effect of omitted variables. One might argue that foreign firms possess both higher know how and thus are more productive and, at the same time, have a privileged access to credit. However, when we include the foreign ownership dummy, the coefficient on LINE is unchanged. Similarly, publicly owned firms might be both less productive and systematically favored by banks. Nonetheless, including in the regression the percent of capital that is state owned leaves our conclusions unchanged. One might also argue that systematically paying bribes to obtain public services and licenses might both lower firms productivity and also affect the extent to which firms can get access to credit. To control for this potential issue, we include the percentage of sales that firms report to be paying as bribes to public officials. Bribing is not significantly associated with productivity nor is the coefficient on LINE affected by the inclusion of this additional regressor. Finally, as in the OLS regression, we control for workforce education, as a proxy for managerial ability, which in turn may influence productivity and access to credit. We find, once again, that the estiamted coefficient on LINE is not significantly affected.

Next, we assess whether our results are robust to using alternative measures of access to credit. Specifically, we use the individual indicators for availability of credit line only (CREDLINE) or availability of overdraft facility (OVERDRAFT). These

indicators are significant at 10% and 5% level respectively. This suggest that both facilities are important for improving access.

We also assess whether our results are robust to using alternative measures of productivity (Table 7). We find our results to be robust to using various productivity estimates: column (1) reports TFP obtained from IV estimation; column (2) reports estimates obtained by using value added instead of total sales as dependent variable in production function; and column (3) reports TFP adjusted for possible biases TFP_ADJ (discussed in the section 3).

Finally, instead of TFP we use two alternative measures of productivity – (log) sales per employee and (log) sales per fixed capital. We find that LINE has the predicted and significant effect on sales to employees ratio. However, the impact of credit on sales per fixed capital, although of the expected sign, is not statistically significant. Most likely, this result reflects the fact that sales per capital is reversely related to the capital intensity of the firm, which has often been associated with increased access to credit.

5. Conclusions

Although a vast literature highlights the positive impact of financial development on growth, the evidence on the channels through which credit affects growth on the micro level is still limited. We estimate whether access to credit has an impact on firm productivity. To do so we first estimate TFP in a cross section of Bulgarian firms and then assess the impact of access to credit on TFP. To overcome the potential omitted

variable bias problems with OLS estimates, we use information on past firm growth to instrument for access to credit. When doing so we find credit to be strongly and positively associated with productivity across firms. This result is robust to a number of robustness checks, including using alternative estimates of TFP and a large set of controls in the specification.

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Table 1. Tabulations

Panel A. Firm size and sector

In each cell, the first number is the number of firms, second number is row percent and third number is column percent.

Size	Manufacturing	Construction	Services	Total
Micro	76	6	63	145
	52.41	4.14	43.45	100
	22.62	13.95	40.13	26.8
Small	113	13	52	181
	62.43	7.18	28.73	100
	33.63	30.23	33.12	33.46
Medium	67	12	24	103
	65.05	11.65	23.3	100
	19.94	27.91	15.29	19.04
Large	80	12	18	112
	71.43	10.71	16.07	100
	23.81	27.91	11.46	20.7
Total	336	43	157	541
	62.11	7.95	29.02	100
	100	100	100	100

Panel B. Firm size and access to credit

In each cell, the first number is the number of firms and the second number is the row percent.

Size	Credit line or overdraft?		
	No	Yes	Total
Micro	125	14	139
	89.93	10.07	100
Small	133	42	175
	76	24	100
Medium	63	31	94
	67.02	32.98	100
Large	47	58	105
	44.76	55.24	100
Total	368	145	513
	71.73	28.27	100

Table 2. Summary statistics

Variable	min	25th percentile	50th percentile	75th percentile	max	mean	sd	N
Log Sales	0.00	4.88	6.52	7.82	11.55	6.36	1.99	271
Log Capital	0.00	4.11	5.99	7.24	11.03	5.70	2.29	205
Log Employment	0.69	2.40	3.43	4.54	7.38	3.49	1.34	541
Log Wages	0.69	3.22	4.50	5.56	9.02	4.44	1.61	353
Log sales / employees	-0.22	2.15	2.78	3.34	8.96	2.78	1.10	270
Log Sales/ capital	-3.67	-0.05	0.69	1.61	4.49	0.72	1.37	195
Investment	0.00	0.00	7.00	30.00	101.00	23.30	34.68	496
R&D	0.00	0.00	0.00	0.00	70.00	2.11	7.08	463
TFP	-2.57	-0.60	-0.01	0.50	3.04	0.00	0.91	196
Log Age	0.00	2.08	2.56	3.26	4.82	2.68	0.86	548
Sales sold domestically (%)	0.00	70.00	100.00	100.00	100.00	80.37	33.27	534
Previous government ownership dummy	0.00	0.00	0.00	1.00	1.00	0.39	0.49	546
Foreign ownership dummy	0.00	0.00	0.00	0.00	1.00	0.10	0.29	545
Workforce education	0.00	7.00	20.00	33.00	100.00	25.45	27.11	525
Positive growth in 2001	0.00	0.00	1.00	1.00	1.00	0.52	0.50	338
Positive growth in 2002	0.00	0.00	1.00	1.00	1.00	0.52	0.50	347

Table 3. Estimating TFP

Capital is measured by fixed assets, employment is measured by number of people; Investment is new buildings, machinery and equipment, expressed as % of the annual sales, R&D is Research and development, expressed as % of the annual sales. Model (8) is estimated by IV (using log wage, investment and R&D as instruments), while models (1)-(7) are estimated by OLS. Robust t statistics in brackets, *, ** and *** indicate significance at 10%, 5% and 1% respectively. "Overid p-value" is a p-value for overidentification test.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Log Sales	Log Sales	Log Sales	Log Sales	Value added	Log Employment	Log Capital	Log Sales
Sectors:	all sectors	manufacturing	construction	services	all sectors	all sectors	all sectors	IV all sectors
Log capital	0.302	0.271	0.376	0.332	0.404			0.250
	[6.23]***	[4.07]***	[1.98]*	[4.24]***	[6.04]***			[1.02]
Log employment	0.793	0.822	0.675	0.791	0.533			0.930
	[10.24]***	[8.18]***	[1.22]	[6.02]***	[5.35]***			[2.85]***
Manufacturing dummy	0.006				-0.400	0.188	0.087	-0.004
	[0.04]				[1.88]*	[2.65]***	[0.30]	[0.02]
Construction dummy	0.297				0.078	0.249	-0.198	0.096
	[1.29]				[0.27]	[2.41]**	[0.42]	[0.34]
Log Wage						0.774	1.033	
						[38.92]***	[13.94]***	
Investment						0.001	0.014	
						[1.38]	[2.48]**	
R&D						-0.005	-0.022	
						[2.10]**	[1.92]*	
Constant	1.727	1.808	2.092	1.582	6.305	-0.064	0.799	1.535
	[9.03]***	[8.22]***	[1.42]	[5.90]***	[22.92]***	[0.64]	[2.05]**	[4.41]***
Observations	196	131	20	45	130	313	169	165
R-squared	0.78	0.78	0.61	0.78	0.73	0.85	0.60	
Overid p-value:								0.88

Table 4. Access and productivity, OLS

LINE is a dummy variable for firms that have either credit line or an overdraft facility. Workforce education is measured by percent workforce with over 12 years education (university and post-graduate). Robust t statistics in brackets, *, ** and *** indicate significance at 10%, 5% and 1% respectively.

	(1)	(2)	(3)	(4)
Dependent variable:	TFP	TFP	TFP	TFP
Micro firm dummy	-0.676	-0.644	-0.360	-0.393
	[3.12]***	[2.92]***	[1.72]*	[2.00]**
Small firm dummy	-0.259	-0.224	-0.039	-0.136
	[1.33]	[1.17]	[0.19]	[0.71]
Medium firm dummy	-0.484	-0.490	-0.338	-0.425
	[2.74]***	[2.73]***	[1.97]*	[2.69]***
Previous government ownership	-0.277	-0.298	-0.171	-0.161
	[1.40]	[1.53]	[0.85]	[0.83]
Log age	-0.092	-0.080	-0.122	-0.084
	[0.86]	[0.77]	[1.21]	[0.88]
Sales sold domestically (%)	0.005	0.006	0.006	0.006
	[2.45]**	[2.73]***	[3.09]***	[3.11]***
Manufacturing dummy	0.075	0.079	0.101	0.125
	[0.44]	[0.46]	[0.61]	[0.76]
Construction dummy	-0.103	-0.076	-0.057	0.041
	[0.44]	[0.32]	[0.25]	[0.19]
Foreign ownership		0.251		
		[1.03]		
Line			0.561	0.489
			[3.57]***	[3.41]***
Workforce education				0.012
				[4.40]***
Constant	0.335	0.203	-0.131	-0.368
	[1.03]	[0.60]	[0.40]	[1.13]
Observations	192	190	191	187
R-squared	0.09	0.11	0.16	0.25

Table 5. First stage – access to credit

Dependent variable is LINE. Robust t statistics in brackets, *, ** and *** indicate significance at 10%, 5% and 1% respectively.

	(1)	(2)	(3)
Dependent variable:	Line	Line	Line
Micro firm dummy	-0.458	-0.461	-0.444
	[5.44]***	[5.50]***	[5.23]***
Small firm dummy	-0.352	-0.361	-0.347
	[4.34]***	[4.52]***	[4.28]***
Medium firm dummy	-0.235	-0.260	-0.240
	[2.78]***	[3.12]***	[2.84]***
Previous government ownership	-0.028	-0.035	-0.030
	[0.39]	[0.50]	[0.41]
Log age	0.011	0.020	0.017
	[0.24]	[0.45]	[0.37]
Sales sold domestically (%)	-0.001	-0.001	-0.001
	[0.94]	[0.77]	[0.92]
Manufacturing dummy	0.010	0.000	-0.001
	[0.13]	[0.01]	[0.01]
Construction dummy	0.197	0.213	0.238
	[1.41]	[1.55]	[1.61]
Positive growth in 2001	0.138		0.076
	[2.90]***		[1.25]
Positive growth in 2002		0.147	0.093
		[3.22]***	[1.58]
Constant	0.490	0.468	0.462
	[3.15]***	[3.06]***	[2.97]***
Observations	312	321	311
R-squared	0.22	0.21	0.22

Table 6. Access and productivity, Instrumental Variables.

LINE is a dummy variable for firms with credit line or overdraft; Informal payments are payments to public officials (% of sales); Workforce education is measured by percent workforce with over 12 years education (university and post-graduate). "Overid p-value" is a p-value for overidentification test. Robust t statistics in brackets, *, ** and *** indicate significance at 10%, 5% and 1% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	TFP	TFP	TFP	TFP	TFP	TFP	TFP
Line	2.941	3.137	2.860	2.932	2.629		
	[2.35]**	[2.33]**	[2.14]**	[1.83]*	[2.17]**		
Micro firm dummy	1.223	1.412	1.162	1.093	1.095	1.511	0.523
	[1.51]	[1.60]	[1.34]	[1.02]	[1.37]	[1.26]	[0.96]
Small firm dummy	1.084	1.238	1.031	1.176	0.976	1.191	0.539
	[1.56]	[1.63]	[1.39]	[1.25]	[1.46]	[1.33]	[1.11]
Medium firm dummy	0.492	0.575	0.467	0.361	0.387	0.703	-0.339
	[0.98]	[1.07]	[0.91]	[0.62]	[0.78]	[0.95]	[1.14]
Previous government ownership	0.443	0.493	0.433	0.480	0.462	0.664	0.523
	[0.97]	[1.02]	[0.96]	[0.77]	[1.04]	[1.12]	[1.19]
Log Age	-0.343	-0.341	-0.328	-0.416	-0.328	-0.446	-0.413
	[1.55]	[1.45]	[1.43]	[1.45]	[1.45]	[1.47]	[2.18]**
Sales sold domestically (%)	0.010	0.011	0.010	0.009	0.008	0.014	0.002
	[2.45]**	[2.41]**	[2.51]**	[2.07]**	[2.13]**	[2.03]**	[0.55]
Manufacturing dummy	-0.633	-0.640	-0.603	-0.633	-0.577	-0.469	-0.684
	[1.17]	[1.10]	[1.08]	[1.03]	[1.13]	[0.70]	[1.61]
Construction dummy	-0.910	-0.933	-0.895	-0.615	-0.714	-0.660	-0.246
	[1.18]	[1.13]	[1.16]	[0.75]	[0.98]	[0.68]	[0.49]
Foreign owned		0.387					
		[1.16]					
% State owned			-0.004				
			[0.41]				
Informal payments				0.007			
				[0.30]			
Workforce education					0.008		
					[1.54]		
Credit line						4.192	
						[1.83]*	
Overdraft							2.677
							[2.34]**
Constant	-1.056	-1.345	-1.047	-0.798	-0.987	-1.622	0.635
	[1.25]**	[1.50]	[1.26]	[0.76]	[1.35]	[1.21]	[1.39]
Observations	134	134	134	103	130	133	130
Overid p-value:	0.77	0.83	0.78	0.69	0.78	0.78	0.84

Table 7. Robustness checks on TFP definition.

Robust t statistics in brackets, *, ** and *** indicate significance at 10%, 5% and 1% respectively.

Dependent variable:	(1) TFP /IV	(2) TFP_VA	(3) TFP_ADJ	(4) Log sales/ employees	(5) Log Sales/ capital
Line	2.991	3.529	2.823	4.162	1.293
	[2.37]**	[2.35]**	[2.30]**	[2.04]**	[0.97]
Micro firm dummy	1.528	2.234	1.151	1.832	-0.146
	[1.87]*	[2.16]**	[1.46]	[1.46]	[0.19]
Small firm dummy	1.254	1.561	1.047	0.919	0.386
	[1.78]*	[1.82]*	[1.54]	[0.97]	[0.58]
Medium firm dummy	0.574	0.967	0.464	0.801	0.003
	[1.13]	[1.60]	[0.96]	[1.16]	[0.01]
Previously government owned	0.465	0.280	0.388	0.236	-0.327
	[1.00]	[0.48]	[0.87]	[0.41]	[0.71]
Log age	-0.356	-0.138	-0.350	0.021	-0.447
	[1.57]	[0.46]	[1.62]	[0.08]	[2.12]**
Sales sold domestically (%)	0.011	0.012	0.010	0.011	0.006
	[2.55]**	[1.69]*	[2.42]**	[1.91]*	[1.30]
Manufacturing dummy	-0.618	-1.000	-0.623	-0.621	-0.537
	[1.14]	[1.47]	[1.16]	[1.18]	[0.85]
Construction dummy	-0.699	-1.423	-0.873	-0.871	-0.133
	[0.90]	[1.29]	[1.14]	[0.91]	[0.16]
Constant	-1.246	1.749	-1.022	0.150	1.791
	[1.45]	[1.20]	[1.24]	[0.11]	[2.02]**
Observations	134	98	134	169	133
Overid p-value:	0.74	0.85	0.83	0.59	0.44